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Estimating Emissions Benefits of Project-based GHG Mitigation Activities: A Case Study Approach

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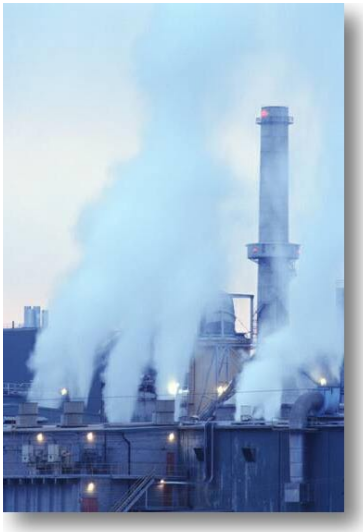

Over the last decade, the international community has engaged in a series of negotiations to develop a response to global climate change and rising greenhouse gas (GHG) emissions. Among the issues being debated is the use of flexible market-based mechanisms. These mechanisms are designed to reduce the costs associated with GHG emission mitigation efforts. The development of protocols for quantifying the emission benefits of GHG reduction efforts will be crucial to implementing any framework for responding to global climate change. Project investors will need clear guidelines for project development. They will also need to be assured of the credibility of the estimated emissions. Procedures for standardized project evaluation and emissions baseline development will help to reduce project costs and clarify project rules/procedures.

A new NETL report, "Case Study Analysis of the U.S. and EU Market Mechanism Proposals," analyzes four major approaches for market-based emission reduction estimation procedures. All four approaches were originally developed for application to market mechanisms established under the United Nations Framework Convention on Climate Change. Although rooted in the Convention, these market mechanisms are likely to remain relevant under any future GHG-reduction agreement.

Under the market mechanisms, reduction projects will be required to reduce emissions beyond a business-as-usual scenario. Each of the four approaches include tests to determine whether or not the project in fact reduces emissions beyond business-as-usual, or is instead a "free rider."

Market-based mechanisms can significantly reduce the cost of emission reductions.

The Four Approaches

The four approaches analyzed include a proposal presented by the U.S. delegation at the Sixth Conference of Parties in November 2000, the EU positive list approach, the full technology matrix approach, and the hybrid technology matrix approach. The final two approaches, the full and hybrid technology matrixes, were developed by NETL.

The U.S. Proposal: The U.S. proposal is based on a "superior performance" concept, evaluating projects based on their emissions performance. The proposal requires projects to reduce emissions beyond the average for comparable activities. It applies a two-step procedure for dealing with free ridership and baseline development. In the first step, a project's eligibility for credits is determined by comparing a project's emissions with a standard benchmark. The benchmark represents a level of emissions performance that is significantly better than the average for recent, comparable projects. In the second step, the credits to be awarded to qualifying projects are computed by subtracting the project's emissions from a second benchmark, representing the average emissions of recent, comparable projects.

The EU Positive List: The EU approach provides a "positive list" of GHG abating technologies and processes. The EU proposes that only safe, environmentally sound, and clean technologies be included on the list. Only those projects using technologies appearing on the list would qualify for emission credits.

The Full Technology Matrix: The full technology matrix is based on a selected list of country-specific GHG abating technologies. Free ridership and baseline determination take place in two stages. First, a technology is subjected to a free rider test, based on factors such as the commercial viability and market penetration of the candidate technology, to determine whether it should be included in the matrix. The test will be designed to ensure that only advanced, non-commercial technologies qualify for inclusion in the matrix. Second, a stipulated benchmark will be developed for each approved technology based on the emissions performance of a selected group of counterfactual technologies. To qualify for credits, project developers would simply demonstrate that the proposed project technology is included in the matrix. The stipulated benchmark from the matrix would then be used to calculate the project's emission reductions.

The Hybrid Technology Matrix: The hybrid technology matrix approach is based on a combination of the full technology matrix's free rider test and the second step of the U.S. proposal for baseline development.

The Case Studies

The report compares and contrasts each approach's ability to recognize legitimate emission reduction projects. Specifically, the report presents a series of hypothetical case studies designed to test each approach in the context of projects likely to be encountered in the real world. The case studies cover a broad range of sectors and project types. Based on the results of these case studies, recommendations for improving the approaches are also provided.

The report analyzes 40 case studies, including 11 electricity sector projects, 13 industrial sector projects, 9 transportation sector projects, 2 land use and forestry sector projects, 3 residential sector projects, and 2 commercial sector projects. These hypothetical projects focus on several developing and transition countries covering all types of advanced and commercial technologies and processes. Table 1 provides a list of the case studies.

Table 1. The Case Studies

SECTOR	COUNTRY	PROJECT TITLE
Electricity	India	IGCC Power Plant
	India	Heat Rate Improvement
	India	Fuel Switching
	India	Natural Gas Combine Cycle
	India	Gas Turbine Plant
	India	Wind Power
	Kazakhstan	IGCC in Kazakhstan
	Tajikistan	Hydropower
	India	Distributed Generation: Fuel Cells
	China	Transmission Capacity Expansion
	India	Carbon Sequestration for IGCC Plant
Industrial	Azerbaijan	Installation of District Heating System
	Kazakhstan	Cogeneration at Food Processing Plant
	Argentina	Variable Frequency Drives
	Brazil	Retrofit of Energy Efficient Motors
	China	Coke Oven Underfiring Rate Improvement
	Tajikistan	PFC Reductions at Aluminum Plant
	China	Coal Ash Utilization
	Chile	Building Insulation Improvement
	Jordan	Highly Efficient Fertilizer Complex
	China	Industrial Boiler Shutdown
	South Africa	Coal Mine Methane Recovery
	Argentina	Landfill Gas Flaring
	Kazakhstan	Recovery of Associated Natural Gas
Transportation	India	Dedicated CNG Taxis
	India	New Gasoline-Fueled Taxis
	China	Aluminum Rail Cars for Efficient Coal Transport
	S. Africa	Clean Diesel in Transit Buses
	Mexico	Electric Vehicles in Mexico City
	Thailand	Smart Toll System
	Ukraine	46 New Conventional Diesel Buses
	India	New Two-Wheelers
	Brazil	Improving Road Infrastructure
Land Use	Mexico	Forest Protection and Management
	Russian Federation	Afforestation of Marginal Agricultural Land in Russia
Residential	South Africa	Construction of Energy-Efficient Homes in South Africa
	Mexico	Sale of High-Efficiency Light Bulbs for Homes
	Russian Federation	Energy Efficiency of Seven Apartment Buildings
Commercial	Philippines	Energy Efficiency and Conservation Measures in Commercial Buildings
	Indonesia	Motor Replacement Project in Commercial Office Buildings in Jakarta

To obtain a copy of "Case Study Analysis of the U.S. and EU Market Mechanism Proposals" or the individual Case study examples contact Mr. James Ekmann of NETL at phone (412) 386-5716 or visit our website at www.netl.doe.gov

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Conclusions

The report raises specific issues for each of the approaches and offers suggestions for strengthening them. Key conclusions are as follows:

- All four approaches demonstrate the capacity to misclassify free rider projects as legitimate reduction projects (and vice versa). However, the technology matrix approaches resulted in the fewest classification errors.
- All four approaches encountered situations in which they could not be applied. These failures demonstrate the need for an ad hoc, non-standardized back-up methodology that can be tailored to any project.
- The U.S. and technology matrix approaches require comparable facilities for project comparison and baseline development. However, comparable facilities are likely to prove to be non-existent for some countries and sectors.
- In many cases, the data required to perform project analyses proved to be unavailable. Lack of data will be a major problem for all four approaches.
- The EU positive list is less developed than the other approaches. It lacks sufficient clarity in its definition of qualifying technologies, some projects could fit into more than one category on the list, it fails to provide a procedure for quantifying emission credits, and it focuses exclusively on energy-related projects.
- None of the four approaches provide adequate guidance for land use and forestry projects.

In general, the technology matrix approaches encountered the least difficulties in terms of the above issues. Thus far, they appear to offer the best technical solution to the many challenges of evaluating and quantifying emission benefits from GHG mitigation projects.

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